



**Pacific Gas and
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September 1, 2005

PG&E Letter DCL-05-099

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response to Requested Information Part 2 of NRC Generic Letter 2004-02,
"Potential Impact of Debris Blockage on Emergency Recirculation During Design
Basis Accidents at Pressurized-Water Reactors"

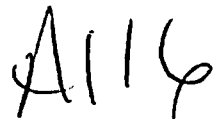
Dear Commissioners and Staff:

NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors" requested that licensees provide information regarding the potential impact of debris blockage on emergency recirculation during design basis accidents. Enclosure 1 provides the information that GL 2004-02 requested to be provided by September 1, 2005.

As noted in the response, certain activities (e.g., confirmatory testing and analysis in support of resolving the issues raised by GL 2004-02) remain to be completed. The schedule for completion of these activities is provided in Enclosure 1. Pacific Gas and Electric Company will submit a supplement addressing the open issues identified in this submittal by September 1, 2006.

Enclosure 2 lists commitments contained in this letter. If you have any questions or require additional information, please contact Stan Ketelsen at (805) 545-4720.

Sincerely,


Donna Jacobs



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September 1, 2005
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jer/3664
Enclosures


cc: Edgar Bailey, DHS
Terry W. Jackson
Bruce S. Mallett
Diablo Distribution
cc/enc: Girija S. Shukla

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)	Docket No. 50-275
PACIFIC GAS AND ELECTRIC COMPANY)	Facility Operating License
)	No. DPR-80
Diablo Canyon Power Plant)	Docket No. 50-323
Units 1 and 2)	Facility Operating License
)	No. DPR-82

AFFIDAVIT

Donna Jacobs, of lawful age, first being duly sworn upon oath says that she is Vice President - Nuclear Services of Pacific Gas and Electric Company; that she has executed this Response to Requested Information Part 2 of NRC Generic Letter 2004-02 on behalf of said company with full power and authority to do so; that she is familiar with the content thereof; and that the facts stated therein are true and correct to the best of her knowledge, information, and belief.

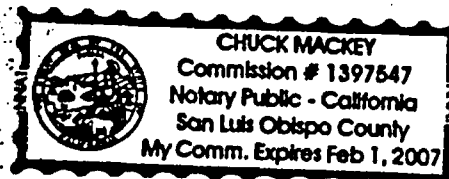


Donna Jacobs
Vice President - Nuclear Services

Subscribed and sworn to before me on this 1st day of September, 2005, by Donna Jacobs, personally known to me or proved to me on the basis of satisfactory evidence to be the person who appeared before me.



Notary Public
County of San Luis Obispo
State of California



**Response to Requested Information Part 2 of NRC Generic Letter 2004-02,
"Potential Impact of Debris Blockage on Emergency Recirculation During
Design Basis Accidents at Pressurized-Water Reactors"**

This enclosure provides Pacific Gas and Electric (PG&E) Company's response to Requested Information Part 2 of NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004. The generic letter's "Requested Information" is shown in *italics* followed by PG&E's response.

NRC Requested Information Part 2

Addressees are requested to provide the following information no later than September 1, 2005:

NRC Requested Information 2(a):

[Provide] Confirmation that the ECCS [emergency core cooling system] and CSS [containment spray system] recirculation functions under debris loading conditions are or will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made and this licensing basis has been updated to reflect the results of the analysis described above.

PG&E Response 2(a):

Activities are in progress to ensure that the ECCS and CSS recirculation functions under debris loading conditions for Diablo Canyon Power Plant (DCPP) Units 1 and 2 will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of GL 2004-02 by December 31, 2007. Compliance will be achieved through analysis, plant-specific flume testing, mechanistic evaluations, plant modifications to reduce debris transport to the containment recirculation sump screens, and programmatic and process changes to ensure continued compliance. The analysis methodology used for demonstrating compliance is that described in Nuclear Energy Institute (NEI) 04-07, Volume 1, "Pressurized Water Reactor Sump Performance Methodology," and NEI 04-07, Volume 2, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to NRC Generic Letter 2004-02," Revision 0, dated December 2004, including NEI 04-07 Section 6; "Alternate Evaluation."

Applicable Regulatory Requirements

GL 2004-02 states:

NRC regulations in Title 10, of the Code of Federal Regulations Section 50.46, 10 CFR 50.46, require that the ECCS have the capability to provide long term cooling of the reactor core following a LOCA [loss-of-coolant accident]. That is, the ECCS must be able to remove decay heat, so that the core temperature is maintained at an acceptably low value for the extended period of time required by the long lived radioactivity remaining in the core.

Similarly, for PWRs [pressurized-water reactors] licensed to the General Design Criteria (GDCs) in Appendix A to 10 CFR Part 50, GDC 38 provides requirements for containment heat removal systems, and GDC 41 provides requirements for containment atmosphere cleanup. Many PWR licensees credit a CSS, at least in part, with performing the safety functions to satisfy these requirements, and PWRs that are not licensed to the GDCs may similarly credit a CSS to satisfy licensing basis requirements. In addition, PWR licensees may credit a CSS with reducing the accident source term to meet the limits of 10 CFR Part 100 or 10 CFR 50.67. GDC 35 is listed in 10 CFR 50.46(d) and specifies additional ECCS requirements. PWRs that are not licensed to the GDCs typically have similar requirements in their licensing basis.

Exceptions to the above for DCPD Units 1 and 2 are the following:

Compliance with GDCs: As stated in the DCPD Final Safety Analysis Report Update (FSARU) Chapter 3, "Design of Structures, Components, Equipment, and Systems," the DCPD units were designed to comply with the Atomic Energy Commission (now the Nuclear Regulatory Commission, or NRC) General Design Criteria for Nuclear Power Plant Construction Permits, published in July 1967. The DCPD construction permits were issued in April 1968 and December 1970 for Units 1 and 2, respectively. FSARU Appendix 3.1A lists the GDCs published as Appendix A to 10 CFR 50 in February 1971 and provides a discussion of conformance with the 1971 GDC (DCPD Units 1 and 2 conform to the intent of the 1971 GDCs).

Credit for CSS: License Amendments 139 (Unit 1) and 139 (Unit 2) dated February 9, 2000, clarified the Bases for Technical Specification (TS) 3.6.6, "Containment Spray and Cooling Systems," to indicate that the CSS is not required to be actuated during recirculation, but may be actuated at the discretion of the Technical Support Center. If containment spray is used during recirculation, it is provided by aligning the residual heat removal (RHR) system to the spray headers.

DCPP Recirculation Sump Design and Testing

The DCP Unit 1 and Unit 2 recirculation sump screens (Figures 1 and 2) were upgraded in 2000 during Unit 1 Refueling Outage 10 (1R10), and in 2001 during Unit 2 Refueling Outage 10 (2R10), respectively. The sump screens were replaced with a new design consisting of a series of perforated plates (1/8 inch perforations spaced at 3/16 inches from center to center) welded into a series of channels to provide approximately 700 square feet of surface area for recirculation flow for Unit 1 and approximately 760 square feet for Unit 2. The arrangement causes sump recirculation flow to run parallel to the plates before passing through the perforations. The parallel flow aids in sweeping the plates clear of debris.

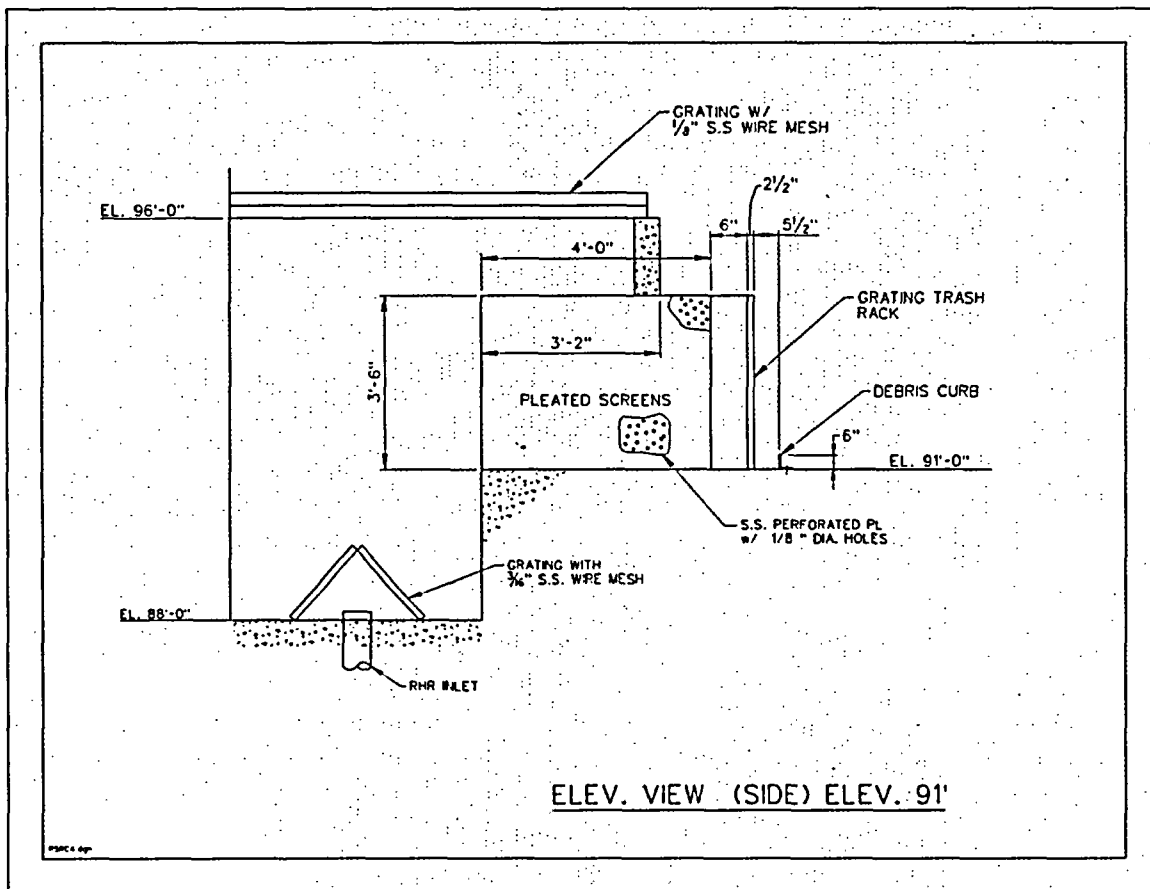


Figure 1
DCPP Recirculation Sump Screen Side View

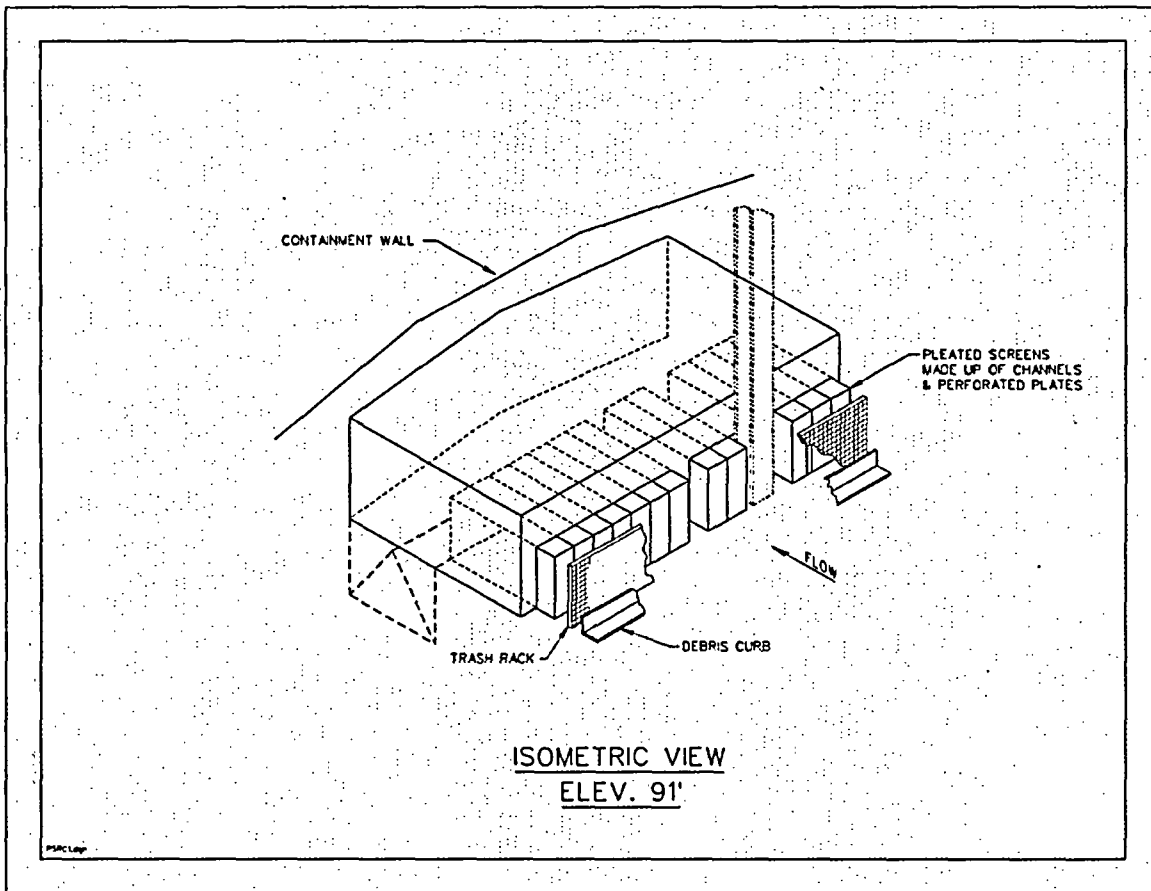


Figure 2
DCPP Recirculation Sump Screen Isometric View

Debris generation and debris transport evaluations have been performed using the baseline methodology as outlined in NEI 04-07 (Chapters 3 and 4). The results of these evaluations were used as inputs for prototypical and debris specific flume tests on the DCPP upgraded recirculation sump screens.

A series of plant-specific screen tests were performed during July 25, 2005, to August 8, 2005. The purpose of these tests was to understand the debris loading performance of the existing screens to determine the scope of modifications required to assure sufficient flow to the ECCS and CSS during recirculation after a LOCA. These tests showed that due to the limited amount of fibrous debris that is deposited on the recirculation sump screen along with the other particulate fine debris, a "thin-bed" is formed with resulting unacceptably high head losses.

These tests showed that a significant reduction in the debris source term is required to assure acceptable head loss utilizing the existing recirculation sump screens. A draft debris generation evaluation has been completed using NEI 04-07 Section 6,

“Alternate Evaluation” methodology. This draft evaluation shows a significant reduction in the amount of debris generated and transported to the recirculation sump. It has been determined that debris mitigation features (e.g., installation of debris interceptors) along with the option of utilizing NEI 04-07, Section 6, “Alternate Evaluation,” will provide an acceptable resolution to the thin bed concern. Table 1 shows debris generation and transport results calculated using the NEI 04-07 Section 6 methodology. Although PG&E is reviewing these results prior to their inclusion into a final analysis report, PG&E does not expect them to change significantly.

Table 1 – Debris Generation and Transport for Alternate Break Size

Debris Type	Debris Size	Debris Quantity Generated	Debris Transport Fraction	Debris Transport Fraction with Debris Interceptor*	Debris Quantity at Sump**
Stainless steel reflective metal insulation (RMI)	Small Pieces (<4")*	9665 ft ²	22%	0%	0 ft ²
	Large Pieces (>4")*	3222 ft ²	63%	0%	0 ft ²
	Total	12887 ft ²	32%	0%	0 ft ²
Low-density fiber glass (LDFG)	Fines	0.6 ft ³	96%	96%	0.6 ft ³
	Small Pieces (<6")	1.3 ft ³	70%	70%	0.9 ft ³
	Large Pieces (>6")*	2.0 ft ³	50%	0%	0 ft ³
	Intact Pieces (>6")*	2.1 ft ³	50%	0%	0 ft ³
Calcium silicate insulation	Pieces Under 1"	15.9 lb	96%	96%	15.3 lb
	Pieces > 1"**	56.2 lb	96%	0%	0 lb
Marinite	Total (Fines)	0	96%	96%	0 lb
Qualified Epoxy (5 D)	Total (Fines)	0.8 lb	96%	96%	0.8 lb
Qualified IOZ (5 D)	Total (Fines)	0.9 lb	96%	96%	0.8 lb
Qualified Ameron 66 (5 D)	Total (Fines)	3.5 lb	96%	96%	3.4 lb
Unqualified Coatings	Total (Chips)*	8460 lb	15%	0%	0 lb
	OEM coatings	70.5 lb	100%	100%	70.5 lb
	IOZ Primer	66.9 lb	100%	100%	66.9 lb
Dirt/Dust	Total (Fines)	51 lb	85%	85%	43 lb
Latent Fiber	Total (Fines)	3.8 ft ³	85%	85%	3.2 ft ³

Table 1 Footnotes:

- * The transport fractions with debris interceptor are 0 percent as these materials will not reach the sump screen based on computational fluid dynamics analysis, interceptor design, and qualification testing.
- ** Debris quantities at the sump screen with assumed debris interceptors. A limited amount of debris located in the containment annulus is expected to be transported to the sump. The existing debris curb and trash rack in the sump screen assembly provides the requisite debris interceptor function for this debris contribution.

As a result of the initial testing discussed above, it had been observed that the manner in which debris was introduced into the flow stream was very conservative and did not permit time for debris settling which would occur following an accident. Specifically, the debris was introduced into the flow stream very slowly in a manner designed to maximize transport to the screens and to conservatively minimize the effects of settling during transport. This testing also demonstrated the fragility of the debris bed, in that most of the debris bed slumped off the screen when flow was stopped, and the debris bed did not begin to reform until several hours after flow was resumed.

Additional tests were performed through August 18, 2005, utilizing the test flume to better characterize the overall effectiveness of the screen assembly and to assess the performance of the screens utilizing a debris mixture representing the debris from an alternate break. These later screen assembly characterization tests were designed to qualitatively evaluate the effects of deposition which would be expected to occur at or near the sump.

The later screen assembly characterization tests introduced debris batches over short periods of time (less than a minute). The results of the characterization tests identified that there is a significant reduction in the quantity of material deposited on the screen and that the overall performance of the screens is considerably better than the extremely conservative testing initially performed.

The final test performed to date examined the performance of the DCPD sump screen assembly utilizing a debris mixture representative of the alternate break discussed above. This final test was performed utilizing the more conservative method of introducing debris (e.g., maximizing transport to screen). Test results showed that the screen assembly was able to maintain acceptable performance with a debris loading greater than 175 percent of the postulated alternate break debris quantity.

Activities to Ensure Compliance

The following is a description of activities that have been or will be completed to ensure that the ECCS and CSS recirculation functions under debris loading conditions at DCP Units 1 and 2 will be in compliance with the requirements of GL 2004-02 by December 31, 2007. These activities have been or will be performed in accordance with the guidance of NEI 04-07 Volumes 1 and 2. Scheduled completion dates are listed in Response 2(b).

1. Containment Walkdown Surveillance – A series of walkdowns were completed during Unit 1 Refueling Outage 11 (Spring 2002) and Unit 2 Refueling Outage 11 (2R11) (Spring 2003). These walkdowns included assessment of potential debris sources including verification of insulation types and locations. Latent debris sampling was performed in Unit 2 during Mode 4, coming out of 2R11. Confirmatory latent debris sampling will be performed on Unit 1.
2. Debris Generation and Transport Analysis – Debris generation and debris transport analyses, bounding for both units, have been performed in support of a modified baseline analysis. A debris generation and debris transport analysis is also being performed utilizing the Section 6, "Alternate Evaluation" methodology as provided in NEI 04-07.
3. Calculation of Required and Available Net Positive Suction Head (NPSH) – The ECCS and CSS flow analyses are documented in PG&E Calculation N-100, Revision 2. Since both sides of the sump screen assembly structure are exposed to the containment atmosphere, head loss across the sump screen is not directly applicable to the pump NPSH margin determination. The head loss across the sump screen is given by an open channel flow correlation. The NPSH margin in this case is governed by the water level inside the sump structure and not specifically by the pressure drop across the screen.

Calculation N-100 conservatively assumes the minimum sump water level during the cold-leg recirculation phase as 88.0 feet, and does not credit the static head in the sump (the recirculation sump screens are installed at 91.0 feet, and the RHR inlet is at 88 feet - refer to Figure 1). For the hot-leg recirculation phase, a conservative sump level of 92.5 feet is assumed since most of the refueling water storage tank (RWST) water inventory has already been transferred into the sump. The RHR pump maximum flow analysis is based on the worst case single failure, which maximizes the centrifugal charging pump (CCP) and safety injection pump (SIP) flows. The maximum SIP and CCP flow analyses are based on a worst case scenario that assumes failure of 4kV Vital Bus F, which disables SIP No.1 and CCP No.1. This system line-up will maximize the RHR pump pressure to the SIP and CCP.

The results of the Calculation N-100 analyses are as follows:

Cold-leg recirculation:

Pump	Flow (gpm)	NPSH Required (ft)	NPSH Available (ft)
RHR Pump No. 1	4541.6	19	23.8
RHR Pump No. 2	4308.8	18	24.2
SIP No. 2	674.9	25	319
CCP No. 2	551.4	25	332

Hot-leg recirculation:

Pump	Flow (gpm)	NPSH Required (ft)	NPSH Available (ft)
RHR Pump No. 1	4891.2	24	27.6
RHR Pump No. 2	4698.9	21	28.0
SIP No. 2	642.9	24	253
CCP No. 2	560.0	26	500

In all cases, the analyses demonstrate that there is ample NPSH margin available for operation of the ECCS and CSS pumps.

It should be noted that since the water level in the sump establishes the NPSH margin, a continuous water supply into the sump must be assured. The limiting condition occurs when the flow across the screen is less than the RHR pump suction flow. This will result in a loss of the RHR pump NPSH due to complete depletion of the sump water inventory.

4. Screen Design – As previously stated, PG&E enlarged the existing Unit 1 and Unit 2 recirculation sump screens in 2000 during 1R10, and in 2001 during 2R10 to provide approximately 700 square feet of surface area for recirculation flow in Unit 1 and approximately 760 square feet in Unit 2. No additional screen modifications are planned.
5. Recirculation Sump Structural Analysis – PG&E will continue to meet its current licensing basis requirements for structural qualification of the sump and screen design. The structural capability of the sump screen design will be reviewed in light of the recent testing and analyses performed in response to GL 2004-02. The review will include verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.

6. Potential or Planned Design/Operational/Procedural Modifications – PG&E will perform an evaluation of procedures for performing work in containment while in Modes 1 through 4 to ensure the inputs and assumptions that support the current analysis effort are incorporated into the applicable documents so as to maintain the necessary attributes for future compliance with these requirements. Examples of these programs are more fully described in Response 2(f).
7. Downstream Effects Evaluation – A downstream effects evaluation has been performed that is bounding for both DCP Unit 1 and Unit 2. The preliminary results show that there are no blockage points within those portions of the ECCS, CSS, reactor coolant system, reactor vessel, and reactor assembly (see fuel discussion below) that would be required to function following a LOCA to maintain the necessary core cooling and containment cooling functions. This evaluation is being finalized.

The downstream effects evaluation also considered the potential for abrasive wear of pumps, orifices, and heat exchangers. Although the evaluation of these components is ongoing, initial results indicate acceptable performance.

The downstream effects evaluation included review of the potential for erosive wear on the valves in the ECCS and CSS. The erosive wear evaluation shows eight of twelve valves pass the wear criteria. Four of the twelve valves, 8810A-D, are still being evaluated. PG&E will complete the evaluation of these valves and correct any deficiencies as required.

The downstream effects evaluation also reviewed the impact on the fuel from debris (particles and fibers) which may pass through the containment sump screens following a LOCA. The evaluation concluded that a thin bed does not form in any of the fuel passages. The evaluation determined for the cold-leg break that the formation of a fiber bed is precluded due to the high rate of bypass flow around the core, as most of the fibrous debris passing through the containment sump screen bypasses the core, and is returned to the containment sump for further filtering. For the hot-leg break, the thickness of the fibrous bed forming on the bottom of the core is calculated to reach 0.107 inches (below the 0.125 inch criteria for a thin bed) assuming a sump screen capture efficiency of 97 percent and a fuel bottom nozzle capture efficiency of 95 percent.

8. Upstream Effects Evaluation – PG&E Calculation N-227, Revision 3, provides the analysis that conservatively estimates the minimum sump water level that would exist at the start of recirculation.

As part of the upstream effects evaluation performed for resolution of GL 2004-02, various locations were discovered that have the potential to hold up water inventory. These potential hold up points will be evaluated and

Calculation N-227 will be revised. Although the evaluation of these locations is ongoing, initial results indicate no plant modifications will be needed to maintain acceptable performance.

9. Chemical Effects Evaluation - PG&E utilizes NaOH during the injection phase of a LOCA, and has calcium silicate and fiberglass insulation as the predominant interacting debris source. The industry and NRC sponsored Integrated Chemical Effects Testing (ICET), Test No. 4, most closely relates to the conditions expected at DCP. Preliminary results show that the chemical effects of Test No. 4 are the least detrimental of the four completed ICET tests. A conservative debris margin of 25 percent has been included in the draft head loss analysis to account for chemical effects. Alion Science and Technology (Alion) is leading an industry effort to perform a head loss analysis associated with chemical effects. This effort will validate the margin used through follow up testing and/or analysis. The Alion testing and analysis is expected to be complete in January 2006. The PG&E head loss analysis will be updated to reflect the results of the chemical effects head loss testing and analysis.
10. Alternate Break Evaluation Region 2 Analysis - In support of the alternate evaluation method, a Region 2 analysis is being performed. PG&E is in the process of establishing the criteria and refinements required to complete the Region 2 analysis.

At this time, PG&E intends to utilize the baseline analysis as a starting point for the Region 2 analysis. PG&E expects to improve the assumptions and methods employed in the debris generation and transport analyses through application of a combination of analytical and test results. These improvements are expected to allow quantification of margins and enhance debris management strategies. In addition, these improvements should result in reductions in the quantities of debris generated and a reduction in the quantity of material which transports to the sump.

Once these analyses have been completed, PG&E will develop procedural guidance for mitigative capabilities for LOCAs larger than the design-basis debris generation break used in the Region 1 analysis. Based on the information currently available from the baseline analysis, these mitigative capabilities can be established using procedural guidance and currently available plant equipment - no additional physical modifications are expected.

11. Final Configuration - The configuration of the plant that will exist once all modifications required for regulatory compliance have been made, in accordance with GL 2004-02, will consist of:

- a. The adequacy of the existing recirculation sump design will be demonstrated on the basis of debris generation, transport, and head loss evaluations that are based on the methodology of NEI 04-07, including use of Section 6, "Alternate Evaluation" methodology.
- b. The following plant modifications will be completed (Response 2(b) - Modifications 1 through 4):
 1. Modify the RHR suction inlet screen at the 88 foot elevation.
 2. Relocate or modify the temporary storage rack in the containment annulus (to reduce debris transport).
 3. Modify the reactor cavity door and curb (to allow more debris to be trapped in the inactive reactor cavity sump).
 4. Add two approximately 18-inch high perforated plate debris interceptors at the entrances to the labyrinth walkway leading to Door 277 in the crane wall (to capture RMI and unqualified coating paint chips).
- c. The licensing basis will be updated to reflect the results of the analyses described above.

NRC Requested Information 2(b):

[Provide] A general description of and implementation schedule for all corrective actions, including any plant modifications, that you identified while responding to this generic letter. Efforts to implement the identified actions should be initiated no later than the first refueling outage starting after April 1, 2006. All actions should be completed by December 31, 2007. Provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006. If all corrective actions will not be completed by December 31, 2007, describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.

PG&E Response 2(b):

As provided in the response to Requested Information 2(a) above, PG&E will be in compliance with the regulatory requirements discussed in the Applicable Regulatory Requirements section of GL 2004-02 by December 31, 2007, including the implementation of all required corrective actions.

Modifications requiring shutdown conditions are expected to be completed for Unit 1 during Unit 1 Refueling Outage 14 (Spring 2007) and for Unit 2 during Unit 2 Refueling Outage 13 (Spring 2006).

The target implementation schedule of known corrective actions and modifications are as follows:

Corrective Action Description	Target Completion Date
1. Finalize the analyses for a. Debris generation, b. Debris transport c. Head Loss d. Downstream effects, e. Upstream effects (See Response 2(a) - Activities 2, 3, 7, and 8)	December 31, 2005
2. Revise the minimum sump level calculation (N-227, Revision 3), to address minor discrepancies discovered during the review process. (See Response 2(a) - Activity 8)	December 31, 2005
3. Perform transport studies to reduce the amount of debris transported to the recirculation sump screens in order to increase margin. During recent flume testing it was made evident that inorganic zinc (IOZ) readily sinks to the bottom of the test flume and a substantial portion of the IOZ assumed to reach the screen in the transport analysis would not be expected to reach the recirculation sump screens. Also, perform testing to determine the size distribution of calcium silicate insulation within the zone of influence (ZOI) and quantify erosion characteristics for calcium silicate and Marinite™ insulation pieces that may be subjected to erosion within the transport pool.	September 1, 2006
4. Perform testing to demonstrate the effectiveness and to refine the design of the debris interceptors. Debris interceptors are required to reduce the debris that reaches the recirculation screen.	April 1, 2006
5. Conduct a test of coatings within the ZOI. A test is planned to be conducted by Wyle Laboratory as a sub-contractor to Westinghouse. The purpose of the test is to demonstrate that the ZOI for coatings may be defined using a radius of 5D (5 times the diameter of the break pipe) versus the 10D as currently recommended in NEI 04-07.	May 1, 2006
6. Update the head loss analysis to reflect the results of chemical effects head loss testing and analysis. (See Response 2(a) - Activity 9)	March 31, 2006

Corrective Action Description	Target Completion Date
7. Submit a license amendment request (LAR) for a change to the RWST TS based on Calc N-227, if analysis indicates a higher water level is necessary. RWST level is currently administratively maintained at a higher level than required by TS. (See Response 2(e))	December 31, 2005
8. Validate the structural capability of the sump. (See Response 2(a) - Activity 5)	June 30, 2006
9. Update TS Bases 3.5.2.8 regarding sump and trash rack inspections. (See Response 2(e))	March 30, 2006
10. Complete design, operational, and procedural modifications. (See Response 2(a) - Activity 6)	December 31, 2007
11. Complete Region 2 analysis to support use of NEI 04-07 Section 6 "Alternate Evaluation" methodology. (See Response 2(a) - Activity 10)	July 1, 2006
12. Perform confirmatory latent debris sampling on Unit 1. (See Response 2(a) - Activity 1)	Unit 1 Refueling Outage 13 (Fall 2005).
13. Implement Containment Latent Debris Assessment Program. (See Response 2(f))	December 31, 2007

Modification Description	Target Implementation Schedule
1. Modify the RHR suction inlet screen at the 88 foot elevation.	Unit 1 - Spring 2007 Unit 2 - Spring 2006
2. Relocate or modify the temporary storage rack in the containment annulus (to reduce debris transport).	Unit 1 - Spring 2007 Unit 2 - Spring 2006
3. Modify the reactor cavity door and curb (to allow more debris to be trapped in the reactor cavity inactive sump).	Unit 1 - Spring 2007 Unit 2 - Spring 2006
4. Add two approximately 18-inch high perforated plate debris interceptors at the entrances to the labyrinth walkway leading to Door 277 in the crane wall (to capture RMI and unqualified coating paint chips).	Unit 1 - Spring 2007 Unit 2 - Spring 2006

NRC Requested Information 2(c):

[Provide] A description of the methodology that was used to perform the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The submittal may reference a guidance document (e.g., Regulatory Guide 1.82, Rev. 3, industry guidance) or other methodology previously submitted to the NRC. (The submittal may also reference the response to Item 1 of the Requested Information described above. The documents to be submitted or referenced should include the results of any supporting containment walkdown surveillance performed to identify potential debris sources and other pertinent containment characteristics.)

PG&E Response 2(c):

In its response to GL 2004-02, Item 1, PG&E stated it would use the methodology described in NEI 04-07 (Reference PG&E Letter DCL-05-014, "90-Day Response to NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated March 4, 2005).

PG&E has performed analyses to determine the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The analyses conform to NEI 04-07, referred to as the Guidance Report or GR, and the NRC Safety Evaluation (SE), except for the refinements and exceptions noted below. A discussion of the exceptions is presented below. In some cases, these analyses are on-going utilizing additional refinements. Specifically, analyses supporting debris transport utilizing hardware modifications (described in Item 2(b) above) have not yet been completed. Specific sensitivity runs have yet to be completed for various debris and transport scenarios. Confirmatory chemical effects testing utilizing DCCP specific materials has not yet been performed.

For many of the areas requiring analysis and/or evaluation, these analyses and evaluations were performed by organizations under contract with PG&E. The Utilities Service Alliance, of which PG&E is a member, selected the Westinghouse Team to supply this facet of the overall resolution of the issue. The Westinghouse Team is comprised of Westinghouse, Alion, Enercon Services (Enercon), and Transco Products (Transco). Westinghouse performed the downstream effects component wear evaluation, and the reactor vessel and reactor fuel blockage evaluations. Alion performed the debris generation, debris transport, head loss evaluations and analyses, and the sump screen testing. Enercon performed the downstream effects ECCS and CSS components blockage evaluation and the upstream effects evaluation. As of this date, the support of Transco (screen

designer) has not been needed for PG&E's effort to resolve the containment sump debris blockage issue.

This effort is being performed under Westinghouse's 10 CFR 50 Appendix B program. PG&E has reviewed and provided comments on the various reports and evaluations that have been performed to date. Upon completion of the individual reports and evaluations, Westinghouse will provide a summary report to PG&E, that will contain the individual evaluations and analyses that were performed. PG&E will then perform an Owner's Acceptance Review of the summary report and enter this report into DCP's records management system. PG&E expects this to be complete by December 31, 2005.

PG&E has taken the following exceptions to the NEI 04-07 GR and SE:

1. Exception(s) Taken to GR and SE for Break Selection

For break selection, the only exception taken to the GR and SE was the use of the criterion specifying "every five feet" as described in Section 3.3.5.2 of the SE. Due to the volume and configuration of DCP's containment, the overlapping ZOIs essentially covered the same locations. The approach used was to determine the limiting debris generation locations (based on ZOIs) and then determine the break location that would provide this debris. This simplification of the process did not reduce the debris generation potential for the worst case conditions as described in Section 3.3 of the GR and SE. Additionally, the larger diameter of the cross-over leg (31 inches) was chosen over that of the hot and cold legs since it results in a larger ZOI.

2. Exception(s) Taken to GR and SE for Debris Generation/ZOI

As stated in Response 2(b) - Corrective Action No. 5, PG&E plans to conduct a test, using Wyle Laboratory, to demonstrate that the ZOI for coatings may be defined using a radius of 5D versus the 10D criterion recommended in NEI 04-07.

3. Exception(s) Taken to GR and SE for Debris Characteristics

For the modified baseline evaluation (baseline evaluation with refinements), no exceptions were taken to the GR and SE. For the Section 6, "Alternate Evaluation," PG&E anticipates that exceptions will be taken with regard to the size distribution of calcium silicate insulation within the ZOI and for the calcium silicate and Marinite™ insulation pieces that may be subjected to erosion within the transport pool. PG&E is currently seeking vendor proposals to perform specific testing to determine the appropriate size distribution to be utilized. The information from this testing will be used in conjunction with testing previously performed by Ontario Power Generation

that provided information regarding the expected size distribution of calcium silicate insulation following a jet blast.

4. Exception(s) Taken to GR and SE for Latent Debris

The methodology provided in the SE (Section 3.5) for collection of the debris samples was not explicitly followed for DCP. At DCP, instead of utilizing a high-efficiency particulate air filter, as suggested in the SE (Section 3.5.2.2), debris samples were collected using a vacuum with mild brush agitation of the surface using an in-line debris collector, with an approximately 2 inch diameter air sample filter (typically used in collecting airborne radioactivity samples) as the filtering media, to collect the debris.

5. Exception(s) Taken to GR and SE for Debris Transport

As previously discussed in the debris characteristics section, PG&E is proposing to perform testing to determine the transport capability of calcium silicate and Marinite insulation fragments, and their potential for erosion in a transport pool flow stream. This may reduce the transport predicted within this analysis.

6. Exception(s) Taken to GR and SE for Coatings

Section 3.4.3.6 of the GR recommends for coatings outside the ZOI, that have not been demonstrated to be design-basis accident (DBA) qualified, should be assumed to fail as chips with a characteristic size of 1 mil for epoxy and epoxy-phenolic coatings and a thickness of 10-microns for IOZ and alkyd coatings. PG&E's evaluation uses an unqualified coating chip size of 0.012 inch by 0.12 inch by 0.12 inch based on previous DBA testing that shows approximately 95 percent of the unqualified coating fails as large paint chips.

Additionally, an exception to the SE Section 3.4.2.1 regarding the qualified coatings ZOI of 10D is being taken based on the expected results of testing that will be performed. This effort was described in more detail in Corrective Action No. 5 under Response 2(b).

EPRI is currently testing original manufacturer and other unqualified coating systems to determine debris characteristics outside the coating ZOI. PG&E may choose to use the EPRI data when the information becomes available. If PG&E chooses to use the EPRI data, this information will be included in the September 1, 2006, supplement to this GL response.

NRC Requested Information 2(d):

The submittal should include, at a minimum, the following information:

NRC Requested Information 2(d)(i):

The minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen.

PG&E Response 2(d)(i):

Refer to Response 2(a), Activity 3.

NRC Requested Information 2(d)(ii):

The submerged area of the sump screen at this time and the percent of submergence of the sump screen (i.e., partial or full) at the time of the switchover to sump recirculation.

PG&E Response 2(d)(ii):

The wetted screen area at the time of switchover to sump recirculation is approximately 510 square feet for Unit 1 and 560 square feet for Unit 2. At this time, the first RHR pump is started and the containment water depth is 2.5 feet. The final containment water depth will be at least 3.4 feet with a wetted sump area of approximately 700 square feet for Unit 1 and 760 square feet for Unit 2.

NRC Requested Information 2(d)(iii):

The maximum head loss postulated from debris accumulation on the submerged sump screen, and a description of the primary constituents of the debris bed that result in this head loss. In addition to debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment (thermal and chemical) and CSS washdown should be considered in the analyses. Examples of this type of debris are disbonded coatings in the form of chips and particulates and chemical precipitants caused by chemical reactions in the pool.

PG&E Response 2(d)(iii):

Refer to Response 2(a), Table 1 and Activity 9 and Response 2(b), Corrective Action No. 1. Preliminary analysis results indicate a head loss of approximately 5.0 inches water gauge across the screen. This analysis conservatively includes a margin of 25 percent (the debris load in the head loss assessment was increased by 25 percent) for chemical effects.

NRC Requested Information 2(d)(iv):

The basis for concluding that the water inventory required to ensure adequate ECCS or CSS recirculation would not be held up or diverted by debris blockage at choke-points in containment recirculation sump return flowpaths.

PG&E Response 2(d)(iv):

Refer to Activity 8, "Upstream Effects Evaluation," in Response 2(a) above.

NRC Requested Information 2(d)(v):

The basis for concluding that inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flowpaths downstream of the sump screen, (e.g., a HPSI [high pressure safety injection] throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles). The discussion should consider the adequacy of the sump screen's mesh spacing and state the basis for concluding that adverse gaps or breaches are not present on the screen surface.

PG&E Response 2(d)(v):

Refer to Activity 7, "Downstream Effects Evaluation," in Response 2(a) above. Also, refer to the "Containment Housekeeping Program" under Response 2(f) for a description of the surveillance procedures used to verify containment cleanliness. These procedures are also used to verify that adverse gaps or breaches are not present on the screen surface.

NRC Requested Information 2(d)(vi):

Verification that close-tolerance subcomponents in pumps, valves and other ECCS and CSS components are not susceptible to plugging or excessive wear due to extended post-accident operation with debris-laden fluids.

PG&E Response 2(d)(vi):

Refer to Activity 7, "Downstream Effects Evaluation," in Response 2(a) above.

NRC Requested Information 2(d)(vii):

Verification that the strength of the trash racks is adequate to protect the debris screens from missiles and other large debris. The submittal should also provide verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.

PG&E Response 2(d)(vii):

Refer to Activity 5, "Recirculation Sump Structural Analysis," under Response 2(a) above.

NRC Requested Information 2(d)(viii):

If an active approach (e.g., backflushing, powered screens) is selected in lieu of or in addition to a passive approach to mitigate the effects of the debris blockage, describe the approach and associated analyses.

PG&E Response 2(d)(viii):

PG&E has not selected an active approach to mitigate the effects of debris blockage. Therefore, this item is not applicable to DCP.

NRC Requested Information 2(e):

[Provide] A general description of and planned schedule for any changes to the plant licensing bases resulting from any analysis or plant modifications made to ensure compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. Any licensing actions or exemption requests needed to support changes to the plant licensing basis should be included.

PG&E Response 2(e):

RWST TS

PG&E Letter DCL-03-097, "Response to NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated August 8, 2003, stated: "The refueling water storage tank (RWST) level is maintained higher than required by Technical Specifications (TS). Surveillance Test Procedure R-20, "Boric Acid Inventory," requires maintaining RWST level at 90 percent level or greater. The minimum TS limit is 81.5 percent level (400,000 gallons as required by TS 3.5.4.2) or 84 percent including instrument error. Maintaining the level at 90 percent or greater adds an additional

27,500 gallons of water to the RWST inventory, taking into account instrument error." PG&E will submit an LAR by December 31, 2005, if analysis results indicate the RWST TS level limit should be raised.

Recirculation Sump Surveillance Requirement (SR)

SR 3.5.2.8 requires verifying by visual inspection, on a 24-month frequency, that each ECCS train containment recirculation sump suction inlet is not restricted by debris and the suction inlet trash racks and screens show no evidence of structural distress or abnormal corrosion. Results of testing and analysis performed to date indicate that some debris catchers and door clearances will need to be relied on for acceptable sump performance. As a result, the term "trash rack" will need to be clarified to include the debris catcher and door designs necessary to assure sump operability. PG&E expects to update the Bases for SR 3.5.2.8 in accordance with its TS Bases Change Program, including evaluation in accordance with 10 CFR 50.59, by March 30, 2006. PG&E does not expect a license amendment will be required for this change.

Use of NEI 04-07 Section 6

The NRC SE for NEI 04-07 states that utilizing Section 6 "Alternate Evaluation" methodology might require licensees to request an exemption from the requirements associated with demonstrating long-term core cooling capability as specified by 10 CFR 50.46(b)(5). For example, exemptions from the requirements of 10 CFR 50.46(d) may be required if a licensee chooses to classify new equipment as nonsafety-related or not single-failure proof. Additionally, changes in analytical methodology or assumptions may also require an LAR. Licensees would assess the need for a license amendment request in accordance with the requirements of 10 CFR 50.59.

PG&E has reviewed the SE guidance for use of the NEI 04-07 Section 6 "Alternate Evaluation" methodology and concludes; (1) it can be applied without the need for an exemption from the requirements of 10 CFR 50.46, and (2) it can be applied without the need for an LAR. PG&E's evaluation concludes it will not need to rely on equipment that is nonsafety-related or not single-failure proof. In addition, use of the NEI 04-07, Section 6, methodology is not considered a departure from a method of evaluation described in the FSAR, as updated, because it meets the guidance of NEI 96-07, Revision 1, "Guidelines to 10 CFR 50.59 Implementation," dated November 2000, in that its use is (a) based on sound engineering practice, (b) appropriate for the intended application, and (c) within the limitations of the SE.

NRC Requested Information 2(f):

[Provide] A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment (e.g., insulations, signs, coatings, and foreign materials) will be assessed for potential adverse effects on the ECCS and CSS recirculation functions. Addressees may reference their responses to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," to the extent that their responses address these specific foreign material control issues.

PG&E Response 2(f):

PG&E is reviewing its processes, as discussed in Response 2(a), Activity 6 "Potential or Planned Design/Operational/Procedural Modifications," to ensure they control, monitor, and mitigate potential sources of debris introduced into the containment. These processes include:

Design Control Process

Design changes and modifications to the plant systems or equipment are controlled by Administrative Procedure CF3.ID9, "Design Change Development." For all design changes, this procedure requires that a review be performed on various technical issues. For changes involving work or activities inside the containment, the procedure specifically requires that the design must consider the effect of introducing components/materials, that have the potential to restrict flow across the containment recirculation sump screen. The introduction of components/materials that have the potential of being dislodged by LOCA effects or become dislodged due to the post-LOCA environmental effects and being transported to the sump must also be evaluated for impact on the sump screen. Use of fibrous items or floatable items should be avoided in the design change. Specific attention is paid to paint and thermal insulation inside containment. Cross discipline reviews are required if the changes affect any systems, structures or components under the jurisdiction of another disciplines. All design changes are required to be verified by another competent engineer, who is independent and has no input to the design.

Configuration Control Process

Documents and changes to documents at DCPD that prescribe or verify activities affecting quality are controlled in a manner that precludes the use of inappropriate or outdated documents. Changes to plant drawings are controlled by Administrative Procedures CF3.ID5, "Drawing Preparation and Approval," and CF3.ID6, "Drawing Change Transmittal Processing." These two procedures provide the direction to

update plant drawings to reflect the "as-built" condition after implementation of design changes. These two procedures, together with the design change procedure CF3.ID9, ensure that any changes to the plant are reflected in applicable documents, including drawings, Design Criteria Memoranda, FSARU, calculations, tests, and plant procedures. Updates of all documents are also independently verified.

Containment Housekeeping Program

DCPP has established a Containment Housekeeping Program to verify that no loose debris exists inside the containment. The Containment Housekeeping Program is implemented through procedure AD8.DC57, "Containment Clean Up Procedure". This procedure provides the guidelines and acceptance criteria for containment clean up prior to entering Mode 4 coming out of an outage. The Containment Housekeeping Program is verified through Surveillance Test Procedure (STP) M-45A, "Containment Inspection Prior to Establishing Containment Integrity," STP M-45B, "Containment Inspection When Containment Integrity is Established," STP M-45C, "Outage Management Containment Inspection," and Administrative Procedure AD4.ID9, "Containment Housekeeping and Material Controls."

STP M-45A provides the directions to verify that there is no loose debris in containment prior to establishing containment integrity. This procedure also inspects the recirculation sump trash racks and accessible sump screens for evidence of structural distress and corrosion. STP M-45B verifies that no loose debris is left by an activity performed in the containment after containment integrity is established. STP M-45C, together with AD4.ID9, verifies that no loose debris is left by an activity performed in containment during Modes 3 and 4 coming out of an outage. The activities are classified into two types: inspection activities and work activities. Steps are taken to ensure that all equipment, tools, and materials brought into the containment are accounted for and any debris found during the inspection is removed.

Containment Latent Debris Assessment Program

DCPP plans to establish a Containment Latent Debris Assessment Program to perform a periodic survey of the containment to assure the values assumed for latent debris in the debris generation analysis remain conservative.

Coatings Program

DCPP Modification Installation Procedure MIP CT-2.0, "Coating Quality Monitoring Program (DCP-210)," controls the Coating Quality Monitoring Program and its implementation in order to provide assurance of continued acceptable performance of coatings inside containment. The procedure calls for a general visual inspections and thorough visual inspection of specific areas inside containment. It also requires

that a Level III coating inspection evaluator direct additional special tests such as adhesion tests, dry film thickness tests, sample testing, etc., when visual examination reveals coating defects such as blistering, cracking, flaking, peeling, rusting and physical damage.

LIST OF COMMITMENTS

The following table identifies those actions committed to by Pacific Gas and Electric Company (PG&E) in this document. Any other statements in this letter are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Stan Ketelsen at 805-545-4720.

Regulatory Commitment	Due Date
1. Pacific Gas and Electric Company will submit a supplement addressing the open issues.	September 1, 2006
2. Units 1 and 2 will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of GL 2004-02.	December 31, 2007